

GCSE Physics

Worksheet: Newton's First Law

TIME 35 min	TOTAL 31 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Newton's First Law

NAME _____

CLASS _____

DATE _____

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

0 1 . 1

Complete the sentence.

If the resultant force on a stationary object is zero, the object will

Tick (✓) **one** box.

start to move

☐

remain stationary

☐

accelerate

☐

move at a constant speed

☐

[1 mark]

0 1 . 2

A car travels at a steady speed along a straight, level road. The driving force on the car is 2400 N.

What is the total resistive force acting on the car?

.....

.....

.....

Resistive force = N

[1 mark]

0 1 . 3

What happens to the velocity of a moving object if the resultant force on the object is zero?

.....

.....

[1 mark]

0 1 . 4

Which statement is correct?

Tick (✓) **one** box.

A resultant force is needed to keep an object moving at a steady speed.

☐

An object can only change direction if a resultant force acts on it.

☐

A moving object always slows down when there is no resultant force.

☐

The resultant force on an object moving at a steady speed is in the direction of motion.

☐

[1 mark]

0 2

0 2 . 1

A driver wears a seatbelt. Which law explains why the seatbelt is needed to stop the driver continuing to move forward when the car suddenly stops?

Tick (✓) **one** box.

Newton's First Law

☐

Newton's Second Law

☐

Newton's Third Law

☐

The law of conservation of energy

☐

[1 mark]

0 2 . 2

Complete the sentence.

An object continues to move at a constant velocity, or remain at rest, unless it is acted on by a

.....

.....

.....

[1 mark]

0 2 . 3

Which **two** of these situations involve a zero resultant force?

Tick (✓) **two** boxes.

A car moving at a constant velocity on a level road

☐

A car accelerating from rest

☐

A book resting on a table

☐

A ball falling with increasing speed

☐

[2 marks]

0 3

A lorry moves at a constant velocity in a straight line. The driving force on the lorry is 4120 N. The air resistance on the lorry is 2205 N, and there is also a friction force (rolling resistance) from the road.

0 3 . 1

Give the size of the resultant force on the lorry.

Give a reason for your answer.

.....

.....

.....

.....

[2 marks]

0 3 . 2

Calculate the size of the friction force from the road.

.....

.....

.....

.....

Force = N

[2 marks]

0 4

A cyclist moves at a constant velocity in a straight line. The driving force on the cyclist is 60 N. The air resistance on the cyclist is 30 N, and there is also a friction force (rolling resistance) from the road.

0 4 . 1

Give the size of the resultant force on the cyclist.
Give a reason for your answer.

.....

.....

.....

.....

[2 marks]

0 4 . 2

Calculate the size of the friction force from the road.

.....

.....

.....

.....

Force = N

[2 marks]

0 5

Modern cars have a headrest built into the top of each seat.

0 5 . 1

Explain, using Newton's First Law, why a headrest reduces the risk of whiplash injury to a passenger's neck in a rear-end collision.

[3 marks]

0 6

A spacecraft drifts through deep space at a constant velocity with its engines switched off. No air resistance or significant gravitational force acts on it.

0 6 . 1

Explain why the spacecraft continues to move at a constant velocity.

[2 marks]

0 6 . 2

The pilot fires a small thruster for 2.0 s. The thruster then switches off again. Describe the motion of the spacecraft after the thruster switches off. Give a reason for your answer.

[2 marks]

0 6 . 3

What is needed to keep the spacecraft moving at a constant velocity?

Tick (✓) **one** box.

A constant forward force

☐

No resultant force

☐

A forward force that increases with time

☐

A resultant force opposite to its motion

☐

[1 mark]

0 7

A puck slides across an air-hockey table. A cushion of air under the puck means that friction on the puck is negligible.

0 7 . 1

A player hits the puck. Describe and explain the motion of the puck after it leaves the player's bat.

.....

.....

.....

.....

.....

.....

[3 marks]

0 7 . 2

The puck hits the side of the table and bounces back.
Explain why a force must act on the puck during the collision.

.....

.....

.....

.....

[2 marks]

0 7 . 3

The air supply is switched off while the puck is moving, and the puck slows down.
Explain why.

.....

.....

.....

.....

[2 marks]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Physics · Worksheet: Newton's First Law · 31 marks

Question 1 (4 marks)

01.1 [1 mark]

Correct: remain stationary

01.2 [1 mark]

Answer: 2400 N

- 2400 (N) (1)
-

01.3 [1 mark]

Answer: It stays constant.

- it stays the same / constant (the object keeps the same speed and direction) (1)
-

01.4 [1 mark]

Correct: An object can only change direction if a resultant force acts on it.

Question 2 (4 marks)

02.1 [1 mark]

Correct: Newton's First Law

02.2 [1 mark]

Answer: Resultant force.

- resultant force (1)

Notes: Allow unbalanced force.

02.3 [2 marks]

Correct: A car moving at a constant velocity on a level road; A book resting on a table

Question 3 (4 marks)

03.1 [2 marks]

Answer: Zero: it moves at a constant velocity, so the forces are balanced.

- 0 N / zero (1)
 - the velocity is constant (not accelerating), so the forces are balanced (Newton's First Law) (1)
-

03.2 [2 marks]

Answer: 1915 N

- $4120 - 2205$ (1)
 - 1915 (N) (1)
-

Question 4 (4 marks)

04.1 [2 marks]

Answer: Zero: it moves at a constant velocity, so the forces are balanced.

- 0 N / zero (1)
 - the velocity is constant (not accelerating), so the forces are balanced (Newton's First Law) (1)
-

04.2 [2 marks]

Answer: 30 N

- $60 - 30$ (1)
 - 30 (N) (1)
-

Question 5 (3 marks)

05.1 [3 marks]

Answer: The body is thrown forward by the seat, but without support the head lags behind (N1L), straining the neck; the headrest pushes the head forward with the body, reducing this strain.

- when hit from behind, the car (and the base of the passenger's body, through the seat) suddenly accelerates forwards (1)
 - without a headrest, there is no resultant forward force on the passenger's head, so by Newton's First Law it tends to remain at rest while the body moves forward, bending the neck backwards sharply (1)
 - the headrest provides a forward force on the head as the seat moves forward, so the head accelerates forwards together with the body, reducing the strain on the neck (1)
-

Question 6 (5 marks)

06.1 [2 marks]

Answer: There is no resultant force on it, so by Newton's First Law it keeps moving at a constant velocity.

- there is no resultant force acting on the spacecraft (no gravity, air resistance or friction) (1)
- by Newton's First Law, an object with no resultant force acting on it continues to move at a constant velocity (1)

06.2 [2 marks]

Answer: It moves at a new constant velocity, because there is again no resultant force.

- it moves at a new constant velocity (the velocity it had when the thruster switched off) (1)
- because once the thruster is off there is again no resultant force on it (1)

06.3 [1 mark]

Correct: No resultant force

Question 7 (7 marks)

07.1 [3 marks]

Answer: It moves at constant velocity, because friction is negligible and the weight is balanced, so the resultant force is zero.

- the puck moves at a constant velocity / constant speed in a straight line (1)
- because the resultant force on it is zero (1)
- friction is negligible and the weight is balanced by the upward force from the air cushion (1)

07.2 [2 marks]

Answer: Its velocity changes (the direction reverses), and a change in velocity needs a resultant force.

- the velocity of the puck changes (its direction reverses) (1)
- a change in velocity needs a resultant force (1)

07.3 [2 marks]

Answer: Friction now acts against the motion, giving a backward resultant force, so the puck decelerates.

- friction now acts on the puck (opposite to its motion) (1)
- so there is a resultant force backwards and the puck decelerates (1)